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IDENTIFICATION OF PRELIMINARY REMEDIAL TECHNOLOGIES FOR THE SAUGET SITES/DEAD CREEK REMEDIAL INVESTIGATION AND FEASIBILITY STUDY

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Prepared for:

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1. INTRODUCTION

As part of Task 9 of the Remedial Investigation (RI), E & E performed a preliminary assessment of potential response actions and applicable remedial technologies for the Sauget sites to aid in evaluating alternatives during the Feasibility Study (FS). The assessment relied on E & E's Remedial Action Technology Management Information System (RATMIS), a data base developed to categorize and document waste treatment and remedial action technologies.

This report presents and discusses the identified response actions and technologies. Section 2 is a summary and discussion of data on site and waste characteristics, and known or probable site problems. Section 3 identifies the potential response actions applicable to each site; the remedial technologies applicable to each response action; and the data requirements for the evaluation of each technology.

2. IDENTIFICATION OF SITE CONDITIONS/PROBLEMS

The Sauget sites consist of 18 sites, including six portions of Dead Creek and 12 terrestrial contaminated waste sites. The six creek portions, designated Sectors A through F, and the 12 terrestrial sites, designated Sites G through R, are delineated in E & E's Sauget sites RI/FS Work Plan.

Table 2-1 summarizes information on the six creek sectors and the 12 terrestrial sites. Specific categories of existing or potential pollution problems identified include: air pollution, surface water infiltration/contamination, leachate generation, groundwater contamination, contaminated soils, contaminated sediments, and the presence of wastes in drums, lagoons, or bulk, buried or on the surface. Waste characteristics which are to be determined by sampling and analysis include: physical properties, chemical constituents, persistence, and toxicity.

A detailed description of each site, its disposal activity history, previous investigations, known contamination, and planned RI field investigation activities are presented in the Current Situation Report, Task 5 of the RI.

Table 2-1

SAUGET SITES PROJECT
CONTAMINATED SITES SUMMARY

Site Designation (1)	Size	Wastes	Groundwater (2)	Surface Water (2)	Sediments
Creek Sector A	25' x 1600'	Direct discharge; process wastewater PCBs, organics, inorganics	1 monitoring well: cadmium, copper, lead, phenol, phosphorus, chlorobenzene, dichlorobenzene, chloroaniline	Cadmium, copper, lead, nickel, phosphosrus silver, zinc, PCBs, aliphatic hydrocarbons	Arsenic, cadmium, copper, lead, mercury, nickel, PCBs, dichlorobenzene aliphatic hydrocarbons
Creek Sector B	30' x 1800'	Direct industrial discharge, organics, inorganics, unknown	4 monitoring wells: arsenic, copper, lead, phosphorus PCBs, chlorophenol	No data	Arsenic, cadmium, copper, lead, mercury, nickel, PCBs, dichlorobenzene aliphatic hydrocarbons, xylene, trichlorobenzene, chloronitrobenzene, biphenyl
Creek Sector C	30' x 1200'	None known, flow from Sectors A and B	3 residential wells: copper, manganese, phosphorus	Copper, phosphorus	Arsenic, chromium, copper, lead, nickel, phosphorus, PCBs
Creek Sector D	35' x 1100'	None known	No data	Copper, phosphorus	Arsenic, chromium, copper, lead, nickel, phosphorus, PCBs
Creek Sector E	25' x 4200' (approximately 500' underground culvert)	None known	No data	No data	Arsenic, chromium, copper, lead, nickel, phosphorus, PCBs
Creek Sector F	30' x 7500' (discharge into floodway)	None known	No data	No data	Copper, lead, phosphorus, zinc

Table 2-1 (Cont.)

Site Designation (1)	Size (acres)	Wastes	Groundwater/ Surface Water	Surface/ Subsurface Soils
G	4.5	Black cinder-like solid in drums; pits - oily wastes; general wastes; metals, demolition debris	3 monitoring wells: (3) arsenic, lead, barium, phenolics, chlorophenol, chlorobenzene, dichlorophenol, dichlorobenzene	Surface: (4) PCBs, copper, lead, nickel, phosphorus, zinc Subsurface: copper, lead, nickel, phosphorus, PCBs (to 9 feet)
H	5	Subsurface disposal; construction debris; solvents; organics - inorganics: chemicals, munitions	1 monitoring well: (3) arsenic, cadmium, lead, phenolics, PCBs, cyclohexanone	No data
I	55	Subsurface disposal; construction debris; solvents: organics - inorganics: chemicals, munitions	1 monitoring well: (3) boron, cadmium, lead, manganese, phenolics, zinc; chlorobenzene, dichlorobenzene, chloroaniline	No data
J	6 - 7	Surface/subsurface disposal: casting sand, slag, baghouse dust, demolition debris	No data	No data
K	6	Subsurface disposal: unknown	No data	No data
L	70' - 150'	Surface impoundment: tank truck wash water; solvents, acids, inorganics - organics	1 monitoring well: (3) arsenic, phenolics, chlorophenol, cyclohexanone	Surface: barium, chromium, copper, lead, nickel, zinc, PCBs
M	275' - 350'	Borrow pit/pond: unknown	Surface water: (3)	Surface sediment: barium, cadmium, chromium, copper, lead, nickel, zinc, PCBs

Table 2-1 (Cont.)

Site Designation (1)	Size (acres)	Wastes	Groundwater/ Surface Water	Surface/ Subsurface Soils
N	9	Borrow pit: subsurface disposal - unknown	No data	No data
O	22	Subsurface disposal: wastewater treatment sludges; PCBs, metals	(plant effluent exceeded) NPDES limits for mercury, PCBs, metals)	Surface soils: solvents (not specified), PCBs, dioxin
P	20	Landfill - drums: phosphorus pentasulfide, diatomaceous earth filter cake, filter residues, fly ash	No data	Surface soils: lead, cadmium, zinc
Q	140	Landfill - drums: solvents; organics - inorganics; municipal wastes	Surface water (leachate): benzene, phenol, PCBs, metals	Subsurface soils: 63 priority pollutants (to 20'); dioxin
R	34	Landfill: drums, bulk liquids; organic - inorganic industrial wastes	9 monitoring wells: (3) lead, nickel, zinc; aliphatic hydrocarbons, chlorobenzene, chlorophenol, biphenylamine, chlorotoluene, chloronitrobenzene, dichlorophenol, dichlorobenzene, diphenyl ether; surface water (leachate): (3) benzene, xylene, PCBs	Surface soils: solvents, PCBs, dioxin

Table 2-1 (Cont.)

(1) Site owners, operators, or source:

G - Operator, source unknown; present owner - Cerro Copper, Wiese Engineering Co.

H - Source: Monsanto Chemical, Area Industries; Operator: unknown (Leo Sauget); present owner: Rogers Cartage Co. (James Tolbira).

I - Source: Monsanto Chemical, Area Industries; Operator: unknown (Leo Sauget); present owner: Cerro Copper (also Creek Sector A).

J - Owner, operator, source: Sterling Steel Foundry (St. Louis Steel Foundry).

K - Source, operator: unknown; present owner: Paul Sauget; Village of Sauget.

L - Source, operator (impoundment): Harold Waggoner Co., Ryan Trucking Co.; present owner: Metro Construction Co.

M - Source, operator: H.H. Hall Construction Co.

N - Source, operator: H.H. Hall Construction Co.

O - Source, operator: Sauget Wastewater Treatment Plant (area industries); owner: Village of Sauget.

P - Source: Monsanto Chemical (Area Industries); operator: Sauget and Co.; present owner: Union Electric Co.; Chicago Title and Trust.

Q - Source: Municipal, Area Industries; operator: Sauget and Co.; present owner: Riverport Terminal and Fleeting Co. (occupied by Pillsbury Co.)

R - Source, owner: Monsanto Chemical; operator: Monsanto/Sauget and Co.

(2) Parameters exceeding IEPA water quality standards and background concentrations.

(3) Concentrations of copper, iron, manganese, phosphorus, and residuals on evaporation exceed standards and background quality.

(4) Dimethyl phenanthrene, phenylindene, pyrene, trimethyl phenanthrene, and aliphatic hydrocarbons.

3. PRELIMINARY IDENTIFICATION OF REMEDIAL RESPONSE ACTIONS

A preliminary assessment of potentially applicable remedial actions at the various Sauget sites was performed by E & E in a two-step process. The first step consisted of surveying all possible remedial action technologies. Approximately 70 different processes or remedial actions were screened using information available from the RATMIS data base. The screening eliminated inappropriate technologies based on the single technical criterion that the remedial action/technology was applicable to a site problem. Table 3-1 lists the general response actions and associated remedial technologies which passed the initial screening.

The second step consisted of a more detailed screening. The criteria used included the following:

- Applicability of a technology to a specific site problem, based on known waste and site characteristics;

- Demonstration of the technology on a pilot or larger scale for a similar type waste problem.

A listing of the remedial actions which may be applicable to the various sites is presented in Table 3-2. The applicability of the actions was determined based on available information on site and waste characteristics identified in Section 2. For sites where no data or very limited data were available, all potentially feasible

Table 3-1

GENERAL RESPONSE ACTIONS AND
APPLICABLE REMEDIAL TECHNOLOGIES

A. AIR POLLUTION CONTROLS

- Dust Suppression (during remedial work)
  - Polymers
  - Water

B. DIRECT WASTE TREATMENT

- Aqueous Wastes Treatment (surface, groundwaters, leachate)
  - Aerobic digestion
  - Anaerobic digestion
  - Oxidation/reduction
  - Neutralization
  - Precipitation/flocculation
  - Ion exchange
  - Membrane technologies
  - Stripping
  - Filtration
  - Activated carbon treatment
  - Discharge to publicly owned treatment works
- Solid Wastes Handling and Treatment (soils, sludges, bulk wastes, drums)
  - Dewatering (phase separation)
  - Composting
  - Oxidation/reduction
  - Solvent extraction
  - Neutralization
- Thermal Destruction
  - Rotary kiln
  - Multiple hearth
  - Fluidized bed combustion
  - Molten salt
  - Wet air oxidation
  - Circulating bed combustion
  - Ultraviolet destruction
- Solidification/stabilization
  - Silicate-based processes
  - Thermoplastic solidification
  - Vitrification

C. IN-SITU TREATMENT

- Biological Processes
  - Bioreclamation
- Chemical Processes
  - Immobilization
  - Soil flushing
  - Detoxification
  - Vitrification
- Physical Processes
  - Permeable treatment beds

Table 3-1 (Cont.)

D. EXCAVATION

- Partial/Total Excavation of Contaminated Soils
- Excavation of Waste Materials

E. SEDIMENTS REMOVAL/CONTAINMENT

- Sediment Removal
  - Dredging
- Sediment Containment (turbidity controls)
  - Curtain barriers
  - Coffer dams

F. SURFACE WATER CONTROLS

- Capping
- Grading
- Revegetation
- Diversion/Collection Systems
  - Dikes and berms
  - Channels and waterways
  - Seepage basins and ditches
  - Levees and floodwalls

G. GROUNDWATER AND LEACHATE CONTROLS

- Groundwater Pumping
- Subsurface Collection Drains
- Containment Barriers
  - Subsurface vertical barriers
  - Bottom sealing

H. GAS MIGRATION CONTROLS

- Perimeter Collection Systems
- Interior Collection/Recovery Systems

I. ON-SITE AND OFF-SITE LAND DISPOSAL/STORAGE

- On-site Landfilling
- Off-site Landfilling
- Surface Impoundments
- Temporary Storage

Table 3-2

GENERAL RESPONSE ACTIONS AND REMEDIAL TECHNOLOGIES APPLICABLE TO SAUGET SITES

	Air Pollution Controls	Direct Waste Treatment				In-Situ Treatment			Removal of Wastes/Soils		Sediments Removal/ Containment		Surface Water Controls				Groundwater/ Leachate Controls			Gas Migration Controls		On/Off Site Land Disposal or Storage	
	Dust Suppression Techniques	Aqueous Wastes Treatment	Solid Wastes Handling/Treatment	Thermal Destruction	Solidification/ Stabilization	Biological Processes	Chemical Processes	Physical Processes	Partial/Total Excavation of Contaminated Soils	Excavation of Waste Materials	Sediment Removal	Sediment Containment	Capping	Grading	Revegetation	Diversion/Collection Systems	Groundwater Pumping	Containment Barriers	Subsurface Collection Drains	Perimeter Collection Systems	Interior Collection/ Recovery Systems	On-Site Disposal	Off-Site Disposal
E & E (IEPA)																							
A		X	X	X	X	X	X	X	X	X	X	X				X							X
B		X	X	X	X	X	X	X	X	X	X	X				X							X
C		X	X	X	X				X	X	X	X				X							X
D		X	X	X	X				X	X	X	X				X							X
E		X	X	X	X				X	X	X	X				X							X
F		X	X	X	X				X	X	X	X				X							X
G (1, 2)	X	X	X	X	X		X	X	X	X			X	X	X		X	X	X			X	X
H (3, 4)	X	X	X	X	X		X	X	X	X			X	X	X		X	X	X			X	X
I (5, 6)	X	X	X	X	X		X	X	X	X	X		X	X	X		X	X	X			X	X
J (7)	X		X		X		X	X	X	X			X	X	X							X	X
K (8)	X		X	X	X				X	X			X	X	X		X	X	X				X
L (9)	X	X	X	X	X		X	X	X	X	X		X	X	X		X	X	X			X	X
M (10)	X	X	X	X	X		X	X	X	X	X		X	X	X		X	X	X			X	X
N (11)	X		X	X	X		X	X	X	X			X	X	X		X	X	X				X
O (12)	X	X	X	X		X	X	X	X	X			X	X	X		X	X	X	X	X	X	X
P (13)	X	X	X	X			X	X	X	X			X	X	X		X	X	X	X	X	X	X
Q (14)	X	X	X	X	X		X	X	X	X			X	X	X	X	X	X	X	X	X	X	X
R (15)	X	X	X	X	X		X	X	X	X			X	X	X	X	X	X	X	X	X	X	X

remedial technologies were considered. Each of the remedial actions listed under the various sites may be applied alone or in combination to address the source(s) of contamination (source controls) and to manage contaminants moving off-site (off-site migration controls).

Upon completion of the RI, the additional field data generated will be used to refine the list of preliminary remedial response actions. A list of data requirements needed to screen and evaluate remedial technologies during the FS is given in Table 3-3.

The post-RI evaluation of remedial technologies will involve:

- Recommending types of remedial technologies appropriate to site conditions;

- Recommending whether to treat, store, or dispose of wastes on-site or off-site;

- Determining the compatibililty of groups of wastes with other wastes and with remedial actions materials; and

- Recommending alternatives for treatment, storage, or disposal for each waste category.

Table 3-3

DATA REQUIREMENTS EVALUATION OF REMEDIAL TECHNOLOGIES

	Air Pollution Controls	Direct Waste Treatment				In-Situ Treatment	Excavation of Wastes/Soils	Sediments Removal/ Containment		Surface Water Controls				Groundwater/ Leachate Controls			Gas Migration Controls	On/Off Site Land Disposal or Storage	
	Dust Suppression Techniques	Aqueous Wastes Treatment	Solid Wastes Handling/Treatment	Thermal Destruction	Solidification/ Stabilization	In-Situ Treatment Processes	Total/Partial Excavation and Removal of Wastes/Soils	Sediment Removal	Sediment Containment	Capping	Grading	Revegetation	Diversion/Collection Systems	Groundwater Pumping	Containment Barriers	Subsurface Collection Drains	Collection/Recovery Systems	On-Site Disposal	Off-Site Disposal
SITE CHARACTERISTICS																			
Accessibility		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Topography	X			X		X	X			X	X	X	X		X		X		
Depth to bedrock						X	X			X	X		X	X	X	X		X	
Bedrock type						X				X	X			X	X	X			
Bedrock permeability/porosity						X									X				
Soil profiles						X	X			X	X	X	X	X	X	X	X	X	
Soil type/texture	X		X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	
Soil permeability/porosity	X		X			X	X	X	X	X	X	X	X	X	X	X	X		
Soil engineering properties			X			X	X	X		X	X		X		X			X	
Soil chemistry	X		X	X	X	X	X	X	X	X	X	X			X		X	X	
Natural groundwater chemistry						X								X	X	X		X	
Aquifer profile/characteristics						X								X	X	X			
Groundwater flow direction/ velocity						X								X	X	X		X	
Groundwater recharge/ discharge areas						X	X							X	X	X		X	
Surface water use		X				X		X	X		X		X	X	X	X			
Drainage area/runoff characteristics						X	X	X	X		X		X	X	X	X	X	X	

Table 3-3 (Cont.)

	Air Pollution Controls	Direct Waste Treatment			In-Situ Treatment	Excavation of Wastes/Soils	Sediments Removal/ Containment		Surface Water Controls				Groundwater/ Leachate Controls			Gas Migration Controls	On/Off Site Land Disposal or Storage	
	Dust Suppression Techniques	Aqueous Wastes Treatment	Solid Wastes Handling/Treatment	Thermal Destruction	Solidification/ Stabilization	In-Situ Treatment Processes	Total/Partial Excavation and Removal of Wastes/Soils	Sediment Removal	Sediment Containment	Capping	Grading	Revegetation	Diversion/Collection Systems	Groundwater Pumping	Containment Barriers	Subsurface Collection Drains	Collection/Recovery Systems	On-Site Disposal	Off-Site Disposal
Stream flow characteristics		x					x												
Floodplain boundaries		x				x	x												
Presence of leachate seeps						x	x	x	x	x	x		x	x	x	x	x	x	x
Wind speed/direction	x		x			x													
Temperature parameters	x		x			x													
Precipitation parameters	x		x			x	x												
WASTE CHARACTERISTICS																			
Physical state	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Chemical composition	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Physical/chemical properties	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x
Quantity	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x